

**REMARKS**

Claims 1– 27 are pending in the application.

Claims 1 – 26 have been objected to because of specific informalities.

Claims 15 – 22 have been rejected under 35 USC 112, second paragraph as indefinite.

Claim 27 has been rejected under 35 USC 102(a) as being anticipated by Doerr (US Patent 6,049,640).

Claims 1-4, 7-12 and 15-26 have been rejected under 35 USC 103(a) as being unpatentable over Doerr.

Claims 5, 6, 13, and 14 have been objected to as being dependent upon a rejected base claim, but deemed allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim.

**Claim Objections**

Applicant has made the Examiner's suggested corrections to claims 1, 2, 11, and 27. As corrected these claims should no longer be objected to.

**Rejection under 35 USC 112, second paragraph**

Claims 15 - 22 have been rejected under 35 USC 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the inventive subject matter.

Claim 15 has been amended to recite how the optical switching apparatus of claim 12 is connected as each of two 2x1 output switches of a 2x2 dilated crossbar switch arrangement. Support for this change can be found in the 2x2 dilated crossbar switch arrangement drawing of Fig. 7A and its associated drawing description on page 6, lines 16 – 18 as well as the description at page 23, lines 7 – 12.

Claim 16 has been amended to recite how the optical switching apparatus of claim 1 is connected as each of two 1x2 input switches of a 2x2 dilated crossbar switch

arrangement. Support for this change is also Fig. 7A and its associated drawing description on page 6, lines 16 – 18 as well as the description at page 23, lines 7 – 12.

Claim 19 has been amended to recite how the optical switching apparatus of claim 1 is connected as 1x2 input switches of a dilated crossbar switch arrangement. Support for this change can be found, e.g., in the 4x4 dilated crossbar switch arrangement drawing of Fig. 7B and its associated drawing description on page 6, lines 20 – 21 and the description at page 23, lines 7 – 12.

Claim 21 has been amended to recite how the optical switching apparatus of claim 12 is connected as 2x1 output switches of a dilated Clos switch arrangement. Support for this change is the dilated NxN Clos switch arrangement Fig. 7D and its associated drawing description on page 7, lines 5 – 6 and the description at page 23, lines 7 – 12.

Claim 22 has been amended to recite how the optical switching apparatus of claim 1 is connected as 1x2 input switches of a dilated Clos switch arrangement. Support for this change is also the dilated NxN Clos switch arrangement Fig. 7D and its associated drawing description on page 7, lines 5 – 6 and the description at page 23, lines 7 – 12.

The amendments to claims 15, 16, 19, 21 and 22 have added no new matter. As amended, claims 15, 16, 19, 21 and 22 should now be definite and allowable under 35 USC 112, second paragraph, and the same is respectfully requested.

### 35 USC 102(a) Rejections

Claim 27 has been rejected under 35 USC 102(a) as being anticipated by Doerr (US Patent 6,049,640).

The arrangement of Doerr is a combination of two imaging arrangements in the form of waveguide grating routers (or star coupling arrangements) 110 and 120 connected by a waveguide array in the form of a phase shifter unit 170 (Col. 3, lines 65-67, 40 – 45). The Doerr arrangement is a wavelength selective cross-connect switch

where each different wavelength of a received multiple wavelength (WDM) signal is switched to one or more waveguides 130 (see Col. 4, lines 5 – 12).

In contrast to Doerr, my arrangement is not wavelength selective but, rather, is a broadband switch which can switch a broadband signal from an input waveguide (e.g.,  $i_1$  of Fig. 1) to an output waveguide ( $K_1$  of Fig. 1). My broadband switch is a single imaging arrangement of two broadband couplers separated by a waveguide array including only three arms (waveguides). With reference to my Fig. 1, my broadband switch requires two conditions (1) that the entire input signal power ( $P_{in1}$ ) be transferred to a good approximation to the three arms ( $P_1, P_2, P_3$ ) and that (2) the power transferred from an input waveguide (e.g.,  $K_1$ ) to the central arm ( $P_2$ ) be approximately equal to the power transferred to the other two arms ( $P_1, P_3$ ). Neither condition can be satisfied by the arrangement used by Doerr. Indeed in Doerr, the power transferred to any particular arm (of 131, 132, 133 of Doerr's Fig.1) is wavelength dependent and, as a consequence, a broadband signal cannot be switched by Doerr's arrangement. This is because the two imaging arrangements 110 and 120 are wavelength dependent and hence can not handle a broadband signal as can my first and second broadband couplers. Additionally, Doerr does not teach or suggest controlling crosstalk by controlling the ratio of combined power transferred to the top and bottom arm to the power transferred to the center arm.

Method claim 27 has been amended to more clearly articulate these differences. Claim 27 now recites that my method is directed to a

- (1) broadband optical switching apparatus (line 1) that
- (2) uses two broadband couplers (line 4) having only three imaging arms (line 5) and which functions to
- (3) maximize broadband optical signal power transfer from the input waveguide to the first output waveguide (lines 21 -23) so that
- (4) the difference between the combined power transferred to the top and bottom imaging arm and the power transferred to the central imaging arm is controlled to have a

ratio close to one so that the crosstalk at a center wavelength of the broadband optical signal does not exceed a predetermined maximum value (lines 25 – 30).

Because of the above-recited differences, the method of operating Doerr's wavelength selective cross-connect clearly does not anticipate nor suggest my amended claim 27 method of operating a broadband optical switching apparatus. Consequently, independent method claim 27 should be allowable over Doerr under 35 USC 102(a) or 35 USC 103(a).

### 35 USC 103(a) Rejections

Claims 1-4, 7-12 and 15-26 have been rejected under 35 USC 103(a) as being unpatentable over Doerr.

As discussed above, Doerr is directed to a wavelength selective cross-connect which does not handle broadband signals. More specifically, Doerr does not teach or suggest what is claimed in independent claim 1, namely

- (1) a broadband optical switching apparatus (claim 1, line 1) that
- (2) uses two broadband couplers (line 3) having only three imaging arms (line 4) which functions to
- (3) maximize broadband optical signal power transfer from the input waveguide to the first output waveguide (lines 21 -22) so that
- (4) the difference between the combined power transferred to the top and bottom imaging arm and the power transferred to the central imaging arm is controlled to have a ratio close to one so that the crosstalk at a center wavelength of the broadband optical signal does not exceed a predetermined maximum value (lines 28 – 32).

There is no hint or suggestion in Doerr as to how to implement my broadband optical switching apparatus using broadband couplers having only three arms and controlling power transfer among the arms so that the crosstalk does not exceed a predetermined level. Consequently, Doerr does not suggest or make obvious amended independent claim 1 under 35 USC 103(a).

Since claim 1 is allowable over Doerr, so should the claims 2-4, 7-12 and 15 – 26 which all depend from claim 1.

Allowable Subject Matter

Dependent claims 5, 6, 13, and 14 have been objected to as being dependent upon a rejected base claim, but deemed allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim.

Since claims 5, 6, 13, and 14 all depend from now allowable claim 1, they should now also be allowable as presented.

In summary for the above reasons, all of the claims 1 – 27 should now be allowable under 35 USC 102(a), 35 USC 103(a), and 35 USC 112, second paragraph, and the same is respectfully requested.

If Examiner has any questions regarding this response, applicant's attorney would welcome a call from the Examiner to discuss them.

Respectfully,

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